Revenue Cutter Service Gunboat *E.A. Stevens*:

The Stevens Family's Civil War Experiment in Modern Naval Technology

By William H. Thiesen

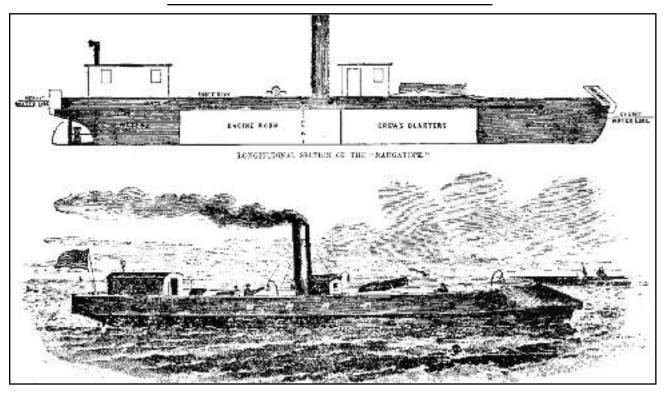


Figure 1. "The Stevens Iron Steam Gun-Boat *Naugatuck*, now at Fortress Monroe." Illustration from *Harper's Weekly*, 1862. (All photographs courtesy of the Naval History & Heritage Command).

The United States Revenue Cutter Service played a unique role in the nineteenth century technological transition from wood and sail to iron and steam. In the 1840s, it built some of the federal government's first iron ships. The service also adopted John Ericsson's successful screw propeller and experimented with the unsuccessful Hunter horizontal wheel propulsion system. The Revenue Cutter Service's Civil War-era gunboat *E.A. Stevens* serves as another example of the

Revenue Cutter Service's willingness to experiment with untested naval technology. This unique vessel also testifies to the wealth of innovations based on iron and steam and introduced by New Jersey's Stevens family, the period's most prolific family of marine engineers and inventors. (Figure 1)

During the late-eighteenth and early nineteenth centuries, all forms of mechanized technology saw a sea change in motive power and construction materials.



Figure 2. Edwin A. Stevens. Line engraving published in The Stevens Ironclad Battery, 1874.

Newly developed technologies associated with iron and steam power, including heavy machinery and railroads, replaced the medieval forms of technology associated with wood and wind energy. By the midnineteenth century, military technology witnessed rapid technological change and, in the years leading up to the American Civil War, inventors took specific interest in new naval technology. These men applied steam and iron to already existing machines of war, such as warships, semisubmersibles, ironclads, rams, ordnance, mines, and torpedoes.

During the late eighteenth century and early nineteenth century, the Stevens family of northern New Jersey proved one of the world's most prolific groups of innovators of naval, military, maritime, and locomotive technology. They relied on the new technologies of steam and iron and tried to solve the issues of naval defense, transportation, and navigation found in their region, including northern New Jersey, along the Hudson River, and around New York City.

Born in 1749, technological innovator John Stevens began his career as a lawyer and played an important part in developing early American patent legislation for American inventions. In fact, he was one of the first citizens to receive a patent under the legislation. John Stevens's true calling proved to be engineering and inventing. He worked diligently on a way to provide steam navigation on the Hudson River. In the early 1800s, he developed the first screw propeller used in America and the first successful multi-tube steam boiler. Both of these advanced marine technologies saw use in 1804, but they were not widely adopted until much later. Stevens next focused his efforts on steam railroading, obtaining charters from the states of New Jersey and Pennsylvania. With the oversight of his capable sons, Robert and Edwin, these railroading ventures would become very profitable.

John's sons also played an important role in developing new iron and steam-related technologies, especially those related to railroads and navigation. Stevens's eldest, John Cox Stevens, proved an excellent yachtsman and, in 1804, piloted the family's first screw-propelled boat from New Jersey across the Hudson River to New York City. He also founded the New York Yacht Club and captained the fast schooner *America*, which brought the coveted *America*'s Cup to the United States in 1851.

John Stevens's younger sons Robert Livingston Stevens and Edwin Augustus Stevens furthered their father's work in developing new nautical technology. Robert Stevens received excellent instruction under tutors and in his father's experimental work. He designed the fast yacht, *Maria*, which defeated *America* before that vessel captured the *America*'s Cup from England in 1851. He helped his father build *Juliana*, which established the world's first steam ferry line by connecting

New York City with northern New Jersey. He assisted in the design and construction of the steamer *Phoenix*, the first American steamer to navigate ocean waters and the first steam ferry to navigate the Delaware River. Robert also pioneered railroad engineering, inventing the T-rail and standard bolts and nuts for railroad tracks, as well as the "hook-headed" spike. Moreover, Robert invented marine technology, such as the hogging truss and skeletal walking beam; and ordnance innovations, such as America's first percussion shell.

Edwin A. Stevens worked side-by-side with his father and brothers on various engineering works. He even invented a new plow design and a special "two-horse dump wagon." Nevertheless, Edwin's genius lay in business, management, and marketing. By the age of twenty-five, John Stevens noticed Edwin's talents and made him the trustee of nearly all of the Stevens family estate. While Robert spent his time engineering and inventing new technology for the Stevens enterprises, Edwin successfully ran a freight and passenger stage line between New York and Philadelphia. In

1830, Edwin became the first manager and treasurer for the Stevens-owned Camden and Amboy Railroad. He would hold this key position with the railroad for another thirty-five years. (Figure 2)

In addition to steam machinery and shipping, the Stevens family interested itself in developing new naval technology as early as the War of 1812. During that war, they conducted the world's first experiments in naval armor and ordnance. Similar experiments conducted by the federal government failed to materialize until later in the nineteenth century. By 1815, the Stevens' suggested the construction of an armored fleet for the United States Navy. Their campaign began well before the French considered construction of their armored vessels in the late 1850s. By the late 1830s, Robert Stevens had begun designing a large ironclad battery, and he and his brother Edwin began lobbying the Navy Department to fund the cost of the warship.

By 1841, amid a war scare with Great Britain over the disputed border with Canada, Edwin, and Robert Stevens pro-

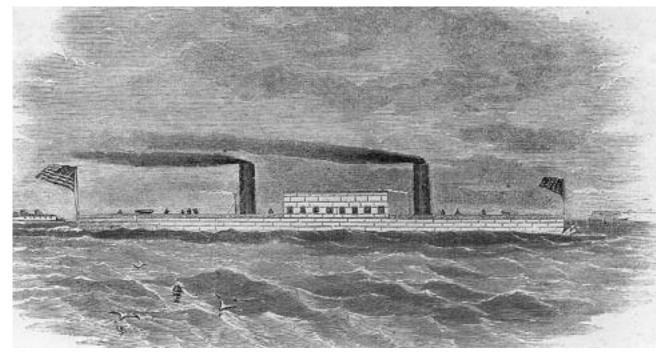


Figure 3. "The Stevens Bomb-Proof Battery as it will appear when completed." Illustration from Harper's Weekly, 1861.

posed building an armored steam warship for the Navy. After tests of the Stevens' armor plate and studying designs presented by the Stevens brothers, the House Committee on Naval Affairs ruled in favor of building the ship. In the spring of 1842, Congress authorized funding for the project and, by early 1843, Congress appropriated to the Stevens brothers \$250,000 to underwrite start-up costs for a new armored steam battery. The cost included tools, supplies, and shipways to support construction of what generally became known as the "Stevens Battery." At 415 feet, the design proved much larger and costlier than ironclads and monitors built during the Civil War: however, design and construction of the Stevens Battery during the 1850s likely shaped the ideas of armored warship builders overseas and in navies on both sides of the Civil War. (Figure 3)

The iron steamer that

became the United States Revenue Cutter Service gunboat *E.A. Stevens* began its service life well before its Civil War service. Built in 1844, the vessel displaced 192 tons and measured 101 feet in length and about

twenty feet across the beam. Originally named *Naugatuck*, the vessel proved one of the first iron propeller ships to navigate American waters. Constructed by the New York City locomotive builder H.R. Dunham & Company, the small vessel served the Ansonia Copper and Brass Company out of Derby, Connecticut. During the

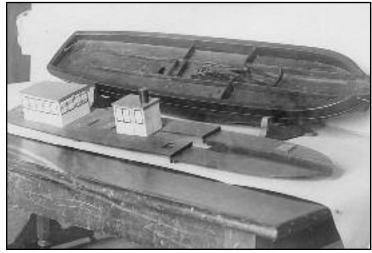


Figure 4. Contemporary model of the Civil War gunboat *Naugatuck*, designed to demonstrate the unique gun mounting.

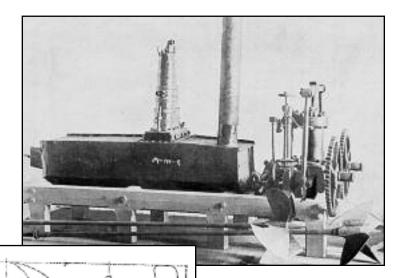


Figure 5. above) Contemporary model of the Stevens family's unique twin propeller arrangement.

Figure 6. (left) Cast iron Stevens propeller. Line engraving published in *The Stevens Ironclad Battery*, 1874.

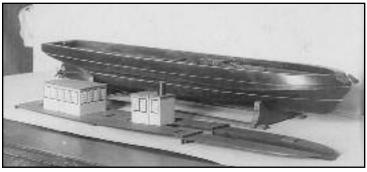


Figure 7. Contemporary model of the Civil War gunboat *Naugatuck*, Showing the armor belt and thick cedar bulwark.

1850s, *Naugatuck* ran between New London and possibly Norwich and New York.

In 1856, engineer Robert Stevens passed away, leaving his younger brother Edwin to oversee reconstruction of *Naugatuck* into a unique steam gunboat. By 1861, Stevens had purchased the vessel to experiment with innovations associated with the much larger *Stevens Battery*, which still sat unfinished on the Stevens's shipways in Hoboken. The reconstructed *Naugatuck* would prove revolutionary in many ways and included a number of patented innovations. In 1861 and early 1862, Stevens rebuilt the deck arrangement to support one heavy cannon fixed amidships on a unique mount of his

design. (Figure 4) Stevens replaced the original drive train with the Stevens family's unique twin propeller arrangement. (Figure 5) He also incorporated ballast tanks fore and aft within the original iron hull. The New York Times reported on March 22, 1862, that "The Naugatuck is not intended to be a model of Mr. Stevens' iron-clad battery, but is designed to illustrate one or two novel ideas connected with that monstrous engine of war, viz: The ability to sink and raise a vessel with great rapidity; to turn and manage her by means of two propellers located one on each side of the stern; also, taking up the recoil of the gun by means of India-rubber." (Figure 6) During this conversion, Stevens named the small iron ship for

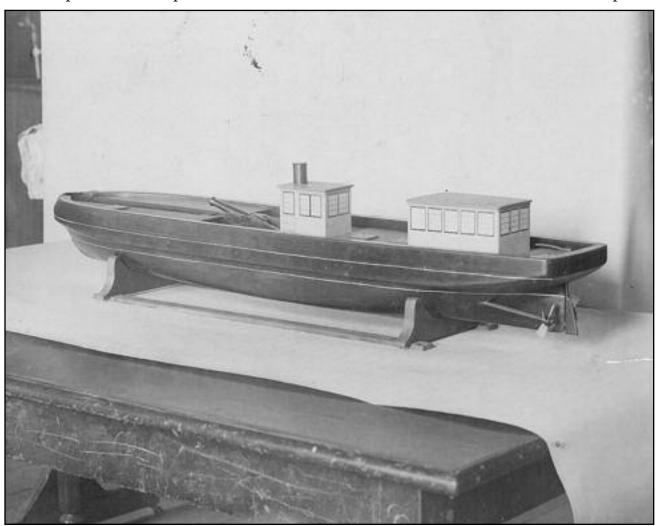


Figure 8. Contemporary model of the Civil War gunboat Naugatuck, showing the deckhouses and stack.

himself; however, many contemporary newspapers and later historians mistakenly termed *E.A. Stevens* the *Stevens Battery*.

Edwin Stevens intended his little gunboat to operate in the shallow inland waterways of the South. To fulfill his goal, he designed into the iron hull ballast tanks located both fore and aft. The tanks also incorporated a patented new gum elastic liner Stevens used to ensure the tanks' watertight seal. These ballast tanks made the Stevens a semi-submersible, allowing the vessel to submerge up to three feet to an overall depth of nine feet. This lowered the gunboat's profile, thereby minimizing the vessel's exposure to enemy fire and placing the vessel's vulnerable steam machinery below the waterline. Edwin Stevens equipped the tanks with heavyduty Andrews Centrifugal Pumps that could fill the tanks in only eight minutes. Conversely, if E.A. Stevens ran aground while ballasted, pumping out the tanks could float the vessel in minutes. Moreover, by pumping the ballast tanks dry, the gunboat doubled its speed from a little over five miles per hour to eleven.

Many contemporaries and maritime historians have associated E.A. Stevens with Civil War ironclads, such as Monitor and Galena, with which it served in the Union Navy's James River Squadron. Some sources even referred to the diminutive warship as the "Hoboken Ironclad." However, E.A. Stevens did not share much in common with these warships. While its hull boasted all iron construction, its only armor consisted of a low-lying angled armor band or skirt surrounding the main deck. This band covered a wooden bulwark built of solid cedar, which rose eighteen inches above the deck and measured fourand-a-half feet in depth. The bulwark surrounded the deck, keeping water off it and providing slight cover from enemy fire. (Figure 7)

E.A. Stevens also supported two

deckhouses located amidships and on the after deck of the gunboat. Positioned forward of the smoke stack, the pilothouse served as the captain's station while underway. During the vessel's tour of duty on the James River, the crew attached boilerplate to the pilothouse as armor against musket fire and ship's captain David Constable reported how musket balls hitting the armor sounded like hailstones raining down in a storm. The after deckhouse served as the galley and quarters for the three officers. It received protective iron plating like the pilothouse. The vessel's enlisted crew of twenty men slept below decks in a compartment located between the engine room and the forward ballast tank. Their quarters also served as the loading room for the main gun during combat operations. (Figure 8)

E.A. Stevens proved a useful platform for testing ordnance innovations as well as new naval designs. The gunboat carried three cannon, including two twelvepound Dahlgren howitzers, one mounted on a pivot on each side. In addition, the ship received the first 100-pound rifled Parrott gun to roll off the production line. The diminutive vessel sported a unique muzzle-loading system in which the rifle's muzzle pivoted down to an opening in the vessel's forward deck, where the crew could load it below decks. With this system, the main gun could be loaded in twenty-five seconds without exposing any of the crew to enemy fire. The main gun's carriage also incorporated Edwin Stevens's patented India rubber gun suspension system, which absorbed over fourteen inches of the gun's recoil movement.

E.A. Stevens's new technology also included an innovative propulsion system. Edwin retained *Naugatuck*'s original steam engines, but he replaced the single screw with the Stevens twin-screw propeller system. The Stevens family had pioneered the development of the twin-screw system

since the beginning of the century and it only made sense to test that technology under combat conditions. With the twin screws, *E.A. Stevens* could revolve in a full circle within its own length in about two minutes. The gun carriage was fixed laterally, so the twin-screw arrangement allowed the captain to train the gun using the helm and the maneuverability of the screws. Moreover, with its top speed of over ten miles per hour considered quite fast for a small vessel of the day, the gunboat also served the role of a dispatch vessel and for quickly delivering the wounded to the Union Navy's base of operations.

Edwin Stevens had to find a federal agency interested in his new vessel, so he offered *E.A. Stevens* to the Union Navy free of charge. The navy, however, declined his offer. because it saw the vessel's technology as untested. Next, Stevens turned to the United States Revenue Cutter Service, which welcomed the opportunity to operate its own steam-powered gunboat. In mid-March of 1861, the Treasury

Department ordered the gunboat to steam south from New York to Hampton Roads. It did so with a crew of over twenty men that included a boatswain, gunner, carpenter, steward, cook, two quartermasters, fourteen seamen, and a "servant." The crew also included some of Stevens's trusted associates, including William W. Shippen, a manager with the Stevens's Hoboken Land and Improvement Company. Shippen took command of the vessel, with Revenue Cutter Service lieutenants J. Wall Wilson and E.L. Morton serving under him. Stevens engineer, Thomas Lingle, who installed the gunboat's new and improved machinery, took the job of chief engineer and remained in that position into 1863.

On April 9, 1862, *E.A. Stevens* reached Hampton Roads and the Union Navy's base of operations to join the North Atlantic Blockading Squadron's James River Squadron. On April 11, under the command of Captain Shippen, *E.A. Stevens* exchanged fire with CSS *Virginia*

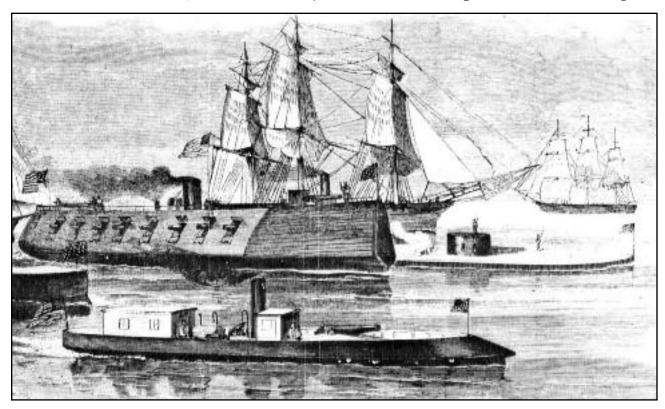


Figure 9. E.A. Stevens with other United States Navy ironclads: Monitor and New Ironsides.

when the ironclad emerged from its anchorage near Craney Island. Virginia's primary target, USS *Monitor*, declined action, so the hostilities proved inconclusive.

On April 29, veteran Revenue Cutter Service officer, Lieutenant David Constable, relieved Shippen and took command of the gunboat and its crew of two dozen. By the time he became captain of *E.A. Stevens*, Constable had already developed into a veteran officer. He received his first commission as third lieutenant in

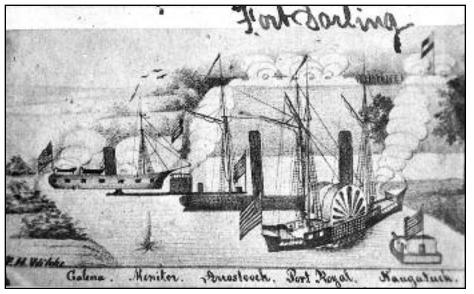


Figure 10. Bombardment of Fort Darling, Drewry's Bluff, Virginia. Contemporary pencil sketch by F.H. Wilcke.

1852. He made his way up the ranks and by 1858, had become executive officer of the cutter *Harriet Lane*. Constable had served as executive officer under distinguished cutter captain John Faunce on April 12, 1862, when *Harriet Lane* fired the first naval shot of the Civil War near Fort Sumter.

On May 8, under Constable's command, the gunboat enjoyed another opportunity to engage CSS *Virginia*. *E.A. Stevens* accompanied *Monitor* and several other Union warships in an effort to engage local Confederate batteries and draw *Virginia* out of its anchorage. With President Lincoln observing from a steam tug, the Union vessels shelled Confederate positions at

Sewell's Point, near Norfolk. The Confederate ironclad emerged briefly to threaten the Union forces, but eventually declined the uneven fight and returned to its anchorage. By May 10, Confederate forces had evacuated Norfolk, leaving the deep-draught Virginia with neither a defensible homeport nor a feasible escape route. On the evening of May 10, commanding officer Iosiah Tattnall ran the ironclad aground near Craney Island and set it on fire. Early the next morning the flames reached the ironclad's magazine, blowing

up what remained of the historic warship.

After the destruction of CSS Virginia, the Confederates retained only a few lightly armed gunboats to counter the superior forces of the Union Navy. In effort to renew Peninsular Campaign, General George McClellan requested a squadron to force its way up the James River and threaten Richmond from the water. To fulfill

this request, North Blockading Squadron commander, Flag Officer Louis M. Goldsborough, assigned Commodore John Rodgers the command of the James River Squadron, which included the navy's wooden warships *Aroostook* and *Port Royal*, the ironclads *Monitor* and *Galena*, and the gunboat *E.A. Stevens*. It would prove the first time-true test of the three innovative warship designs side-by-side under battle conditions. (Figure 9)

Located eight miles south of Richmond, with an elevation of approximately 100 feet, Drewry's Bluff remains one of the highest promontories on the shores of the James River. It overlooks the James at a sharp bend in the river, provid-



Figure 11. Matthew Brady photograph of the ironclad Galena after the Battle of Drewry's Bluff. A plugged shot hole is visible a little abaft the nearer 11-inch Dahlgren smoothbore, close to the waterline.

ing an ideal location for a fortified position to attack approaching vessels. Such a gun emplacement would enjoy the use of plunging fire, which is easier to place on targets and has a devastating effect on any kind of ship. In early May 1862, the Confederates worked feverishly on the bluff's fortifications in preparation for an expected attack. They sank a number of

Confederate gunboats in the channel as obstructions to navigation and hauled some of those vessels' ordnance to the fort on top of the bluff. When the James River Squadron appeared in the morning of May 15, 1862, the battery included eight heavy cannon manned by local Confederate land forces and some naval personnel. The Battle of Drewry's Bluff would prove the

first true test of *E.A. Stevens* under combat conditions. (Figure 10)

The Union warships experienced only minor resistance during their passage up the James River to reach the fortifications at Drewry's Bluff. At 7:45 a.m., on May 15, the battle opened when Rodgers' flagship Galena approached to within 400 yards of the sunken obstructions. The Confederates opened fire and Galena sustained two hits at the very start. Commodore Rodgers calmly moved Galena into position, using its anchor and spring lines, so the vessel could pour a broadside into the Confederate positions. Galena fired round after round of cannon fire into the fort and managed to cause some damage, but Galena got far worse treatment than it gave. The ironclad received approximately forty-five hits of which eighteen penetrated its armor. (Figure 11)

After Galena made contact with the Confederate batteries, USS Monitor made its own approach. The ironclad closed in on the fortifications at about 9:00 a.m., and began shelling the Confederate positions. However, John Ericsson had designed Monitor for naval combat rather than shore bombardment, so its cannon could not elevate sufficiently to hit the fort at the top of Drewry's Bluff. After causing slight damage to the Confederate fort and sustaining hits from the Confederate guns, Monitor retired downstream. (Figure 12)

With the confined width of the James River at Drewry's Bluff, and *Galena* anchored near the fortifications, the squadron's vessels could only file in one at a time. After the withdrawal of *Monitor*, *E.A. Stevens* moved up to take its place. The Stevens's technological innovations worked effectively to protect the ship. The gunboat sustained no heavy damage from the enemy's plunging fire as it sat partly submerged and firing its main battery. Moreover, the gunboat's ordnance loading system successfully protected the crew

from enemy sharpshooters and musket fire.

E.A. Stevens continued to pour rounds into the enemy fortifications, however, the gunboat suffered from the same problem as Monitor. Stevens designed the gunboat's main ordnance to battle Confederate warships in the shallow waters of the South's inland waterways and not for shore bombardment of enemy land fortifications. In any case, E.A. Stevens's bombardment came to an abrupt halt when its 100-pound Parrott rifle burst while firing on Confederate positions. The explosion blew off the gun's breech, damaging the pilothouse and the ship's deck. Despite losing its main gun, the gunboat continued to fight its twelve-pound howitzers with canister and solid shot against enemy shore emplacements.

By 11:00 a.m., Galena had suffered severe damage, exhausted its ammunition. and sustained thirteen dead and many wounded. After four hours of dueling with the Rebels, Rodgers ordered the fleet to retire down river. E.A. Stevens had experienced relatively few casualties despite the hail of musket fire, enemy shelling, and its catastrophic ordnance failure. One of the crew received a shot in the arm and another suffered a serious contusion. The cap-Lieutenant David Constable. sustained a head injury from shrapnel flying off the exploding Parrott gun, but remained at his station directing the broadside guns and commanding the ship throughout the remainder of the battle.

The James River Squadron retired to City Point, with *E.A. Stevens* arriving that evening and the rest of the squadron arriving in the morning of May 16. (Figure 14) On the 16th, Rodgers convened a board, composed of squadron officers, to examine the remains of the Parrott rifle and determine the cause of its failure. The board concluded that rigorous testing and experimentation before installation on board *E.A.*



Figure 12. "View of the Attack on Fort Darling, in the James River, by Commander Rogers's Gun-Boat Flotilla, 'Galena', 'Monitor', etc." Line engraving published in Harper's Weekly, 1862.

Stevens had weakened the gun, which was the first of its kind produced by the manufacturer. Meanwhile, the gunboat received the squadron's wounded and proceeded downriver shortly thereafter to Fort Monroe.

E.A. Stevens had been operating in Virginia waters since early April 1862. Even though its main gun remained shattered, Commodore Rodgers still felt it could provide good service to the James River Squadron. Nevertheless, the vessel saw no serious action after Drewry's Bluff. On Mav 26. 1862. the Treasury Department ordered the gunboat to depart Hampton Roads and steam north to the Washington Navy Yard for repairs. On May 29, while the gunboat underwent these repairs, President Lincoln honored Constable by promoting him to full captain before an audience of his full cabinet. Soon afterward, the Treasury Department transferred Constable to a new assignment, but not one near the front lines of the war.

By mid-July 1862, the gunboat had made its way to New York City to become guard ship for the harbor. Months of this monotonous duty likely caused great boredom among the crew, requiring the commanding officer to order them thrown in irons on a regular basis. Occasionally, they received a harsher sentence, as in the case of Steward Joseph McCaster, who "was

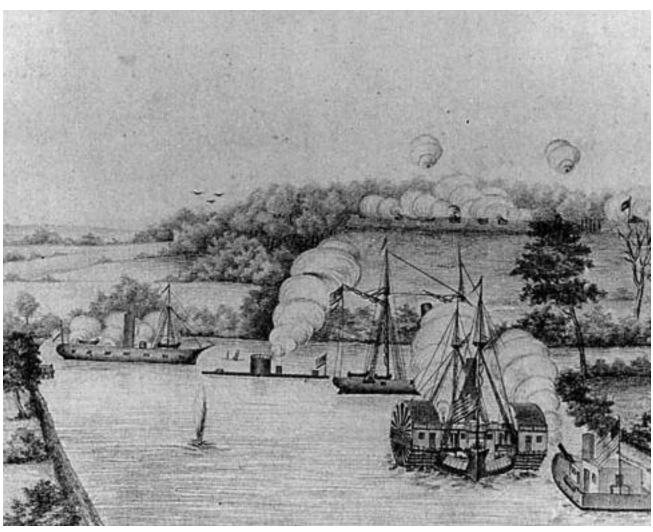


Figure 13. Contemporary pencil sketch, with colors of flags and smoke lightly worked in, depicting the Union ships Galena, Monitor, Aroostook, Port Royal and Naugatuck (listed as shown, left to right) bombarding the Confederate fort at Drewry's Bluff.

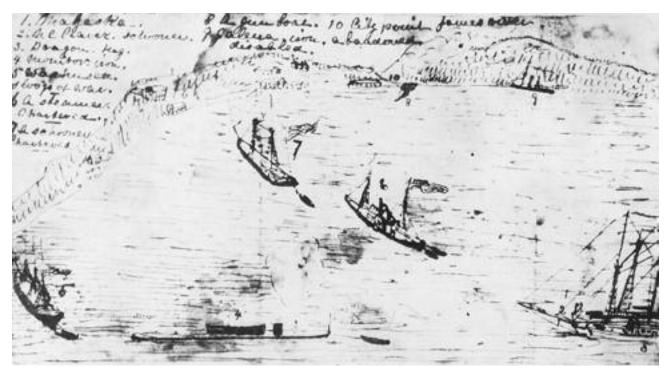


Figure 14. Sketch, possibly by Edward H. Schmidt (a crewman on USS *Mahaska*) depicting the scene off City Point, James River, Virginia, shortly after the action of 15 May 1862. Items identified by numbers include: 1. USS *Mahaska*; 2. Schooner *N.C. Claver*; 3. tug *Dragon*; 4. USS *Monitor*; 5. USS *Wachusett*; 6. chartered steamer; 7. a schooner; 8. a gunboat; 9. USS *Galena*, disabled; 10. City Point, James River, abandoned.

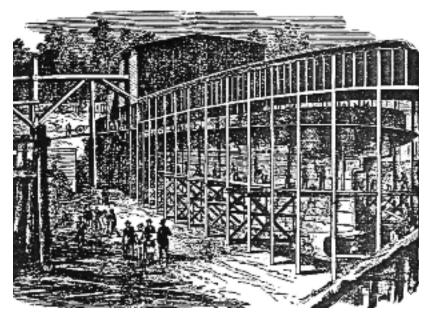
placed in irons and triced up twelve hours at the expiration of which time he was placed in solitary confinement in double irons for two days for insolence to comdg. officer." In July 1863, the gunboat defended the McDougal General Hospital at Fort Schuyler, playing a small role in the infamous New York City Draft Riots. On July 29, Treasury Secretary Salmon P. Chase ordered the gunboat's name to revert from *E.A. Stevens* back to *Naugatuck*. Out of its forty-five years of its existence, the vessel held the name *E.A. Stevens* for little more than three years.

After the conclusion of hostilities, the Treasury Department assigned *Naugatuck* responsibility for patrolling North Carolina's inland sounds, homeported at New Bern. *Naugatuck* served in this duty from late 1865 until the summer of 1889, with periodic trips to New York, Norfolk, and Baltimore for maintenance and repairs. Throughout its career as a gunboat, *E.A. Stevens/Naugatuck* remained

a steamer in the Revenue Cutter Service and never belonged to the United States Navy.

E.A. Stevens battle tested several unique naval technologies, including hidden loading systems, rubber recoil absorbers, multiple screws, high-speed water pumps, and ballast tanks. The use of ballast tanks in *E.A. Stevens* proved one of the most successful applications of that technology up to that time. The twin-screw system proved very useful for speed, maneuverability, and aiming the main gun. Despite the success of the vessel's other innovations, its exploding gun marred an otherwise successful service history.

In an epilogue to this story, the results of *E.A. Stevens*'s combat record did little to bolster federal spending on the larger *Stevens Battery*. The iron warship languished on the shipways during the war, while less expensive battle-proven monitors rolled off the ways at several shipyards along the East Coast. Edwin Stevens tried



to interest the federal government in underwriting the completion of the vessel, but it refused to fund completion of the warship. (Figure 15) In 1868, Edwin Stevens died rather suddenly while touring Europe. With his death, and with his experimental gunboat relegated to the backwaters of North Carolina, interest in completing the *Stevens Battery* faded and, finally, it was scrapped in 1881.

Figure 15. The hull of the Steven's Battery, housed over, still under construction at Hoboken, New Jersey, in 1874. Line engraving published in *The Stevens Ironclad Battery*, 1874.

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